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DONALD R. ANTONELLI  
DAVID T. TERRY  
MELVIN KRAUS  
STANLEY A. WAL  
WILLIAM I. SOLOMON  
GREGORY E. MONTONE  
RONALD J. SHORE  
DONALD E. STOUT  
ALAN E. SCHIAVELLI  
JAMES N. DRESSER

CARL I. BRUNDIDGE



LAW OFFICES  
ANTONELLI, TERRY, STOUT & KRAUS  
SUITE 600  
1919 PENNSYLVANIA AVENUE, N.W.  
WASHINGTON, D. C. 20006

PATENT AGENTS  
LARRY N. ANAGNOS  
JOHN G. SMITH  
TELEPHONE (202) 828-0300  
CABLE "ATPAT"  
TELEX NOS. 440280/248545  
FAX. (202) 828-0380

May 20, 1991

Honorable Commissioner of  
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Dear Sir:

Attached please find the application papers of  
THOMAS J. CAMPANA, JR., MICHAEL P. PONSCHKE and GARY F.  
THELEN, covering new and useful improvements in an SYSTEM FOR  
INTERCONNECTING ELECTRONIC MAIL SYSTEMS BY RF COMMUNICATIONS  
comprising:

Specification, Twenty-Three (23) Claims and  
Abstract of the Disclosure (70 pages)

English Language Declaration and  
Power of Attorney (2 pages)

Twelve (12) Sheets of Informal Drawings  
showing Figs. 1-12 and a copy

Verified Statement Claiming Small Entity  
Status -- Independent Inventor (2 pages)

Appendix - 14 pages of control programs

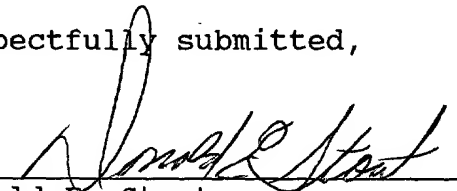
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Respectfully submitted,

  
Donald E. Stout  
Registration No. 26,422  
ANTONELLI, TERRY, STOUT & KRAUS

Enclosures

DES:dlh



780.29767X00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors: THOMAS J. CAMPANA, JR., MICHAEL P. PONSCHKE,  
and GARY F. THELEN

Invention: SYSTEM FOR INTERCONNECTING ELECTRONIC MAIL  
SYSTEMS BY RF COMMUNICATIONS

Antonelli, Terry, Stout & Kraus  
Suite 600  
1919 Pennsylvania Avenue, N. W.  
Washington, D. C. 20006

SPECIFICATION

To all whom it may concern:

Be it known that We, Thomas J. Campana, Jr., Michael P. Ponschke, and Gary F. Thelen, citizens of the United States, residing respectively at 3836 West 86th Street, Chicago, Illinois 60652; 212 Tara Drive, Lockport, Illinois 60441 and 16 Fox Lane, Palos Park, Illinois 60464; have invented certain new and useful improvements in

SYSTEM FOR INTERCONNECTING ELECTRONIC MAIL  
SYSTEMS BY RF COMMUNICATIONS

of which the following is a specification.



501

Description  
Electronic Mail System With RF  
Communications to Mobile Processors

Technical Field

5           The present invention relates to electronic mail systems for transmitting information between processors.

Background Art

10           The use of computers to send and receive electronic mail messages is becoming very popular globally. Numerous companies (both network and software related) offer electronic mail packages (E Mail) and services. Currently, electronic mail services provide a convenient alternative to the more  
15           formal facsimile transmissions of memos and documents. Electronic mail is typically used to send relatively short informal messages between computers within an organization, or to a party located at a distant location or company. Electronic mail services are  
20           basically a wire line-to-wire line, point-to-point type of communications. Electronic mail, similar to facsimile transmissions, provides a one-way message. A recipient typically does not have to interact with the message. Electronic mail, unlike facsimile, is a  
25           non-real-time message transmission architecture.

30           Fig. 1 illustrates a block diagram of a typical electronic mail system 10 in commercial use such as by AT&T Corporation. The electronic mail system 10 is comprised of a plurality of single processors or groups of processors #1-#N with N being any number with each group having individual processors A-N with N being any number. The groups of processors #1-#N may be distributed at locations which are linked by the public

switch telephone network 12. The individual processors may be portable personal computers with a modem which are linked to the public telephone switch network 12 through wired or RF communications as indicated by a dotted line. Groups of associated processors #1-#3 may have diverse configurations with the illustrated configurations only being representative of possible architectures of groups of associated processors. The groups of associated processors may be connected to a host or mainframe computer through various communication mechanisms such as direct telephone communications (#1), communications through a local area network (#2), or communications through a private automatic branch exchange (#3). It should be understood that the illustrated architecture of the single and associated groups of processors is only representative of the state of the art with numerous variations being utilized. Many of the groups of associated processors are contained within the database network of a single company or organization located at distributed geographical locations throughout a country or in different countries.

Communications between an originating processor A-N, which may be any of the processors within the groups of associated processors #1-#3 or processor #N and a destination processor A-N are completed through the public switch telephone network 12 to one or more gateway <sup>switches</sup> ~~switch~~ with mailboxes 14 which function to store the message for delivery to the destination processor at a later point in time. The gateway switches with mailboxes 14 have a storage location, associated with each subscriber which may be any of the computers A-N within the associated groups of computers #1-#3 and individual computers #N, which provides retrieval capability of the electronic message

when it is not delivered directly to the destination processor A-N such as when the destination processor does not go directly off hook in response to an attempt to deliver the message from storage in the electronic mail gateway mailbox storage location associated with the destination processor. In order to originate an electronic mail message, the originating processor A-N calls an associated gateway switch with mailboxes 14 via telephone through the usage of a modem connection. This connection is made through the public switch network 12. A gateway switch with mailboxes 14 answers and provides a data connection to the originating processor A-N. The gateway switch with mailboxes 14 typically contains the originating processor A-N file and verifies that the sending processor is able to originate an electronic mail message via some form of password protection. Upon verification of the entry password, the electronic gateway switch with mailboxes 14 downloads software and entry screens that are displayed on the originating processor to permit a message to be composed. Thereafter, the message is composed and transferred from the originating processors gateway switch with mailboxes 14 to the destination processors gateway switch with mailboxes 14 where the message is stored and an attempt is made to deliver the message to the destination processor via telephone connection through the public switch telephone network 12.

Electronic mail systems have several common items that must be entered in order to originate and send (format) an electronic message. These items include the destination address, which consists of either the person or company's name, an abbreviated form of the person's company or name, or a series of digits or alphanumeric characters that must be entered to

indicate to the electronic mail system the destination address of the recipient processor. Another item is an identification of the originating processor which may be an indication of the sender or the originator's name, company name, an abbreviated form of the originator's name or company name, or a numeric or alphanumeric entry that comprises the sender's name or address. This information is collectively an identification of the originating processor. Another item is the subject of the message which is typically a short reference as to the subject matter of the text or message that follows. Finally, the message or message text must be entered which is the information that is inputted by the person or machine which is originating the message at the originating processor A-N. Upon completion of the message text, the user or machine operating the originating processor A-N enters a series of commands or keystrokes on the originating processor to transmit the message to the gateway switch with mailboxes 14 associated with the originating processor A-N.

The transmission of the message from the originating processor's gateway switch with mailboxes 14 to the destination processor's electronic mail gateway switch with mailboxes is via analog or digital communications through the public switch telephone network. The destination gateway switch with mailboxes 14 contains the destination address of the recipient destination processor.

Upon arrival of the information at the destination processor's gateway switch with mailboxes 14, one of two events takes place. The information is typically stored in the destination processor's electronic mailbox for later retrieval by the destination processor through interaction by the user of the

destination processor. This typically happens as a result of the fact that a person is not located at the destination processor at the time of delivery of the message to the gateway switch with mailboxes 14 or the destination processor is not turned on and connected to the public switch telephone network 12. A second methodology is that the destination processor's gateway switch with mailboxes automatically dials the gateway processor's telephone number to deliver the information. In the situation where the destination processor is within a company or organization, the information may be delivered to the host computer. The destination processor's host computer stores the information until the destination processor calls the host computer to retrieve the information. In both of the methodologies described above, information delivery requires periodically calling a host computer or a mailbox at the gateway switch with mailboxes 14 to determine if new messages are present. This incurs additional costs in telephone calls and/or labor. If the host computer or gateway switch is not checked frequently, the information becomes untimely in its delivery. If the destination processor frequently checks the host computer or gateway switch, then additional costs and telephone calls and/or labor are encountered.

As personal computers are used more frequently by business travellers, the problem of electronic mail delivery becomes considerably more difficult. A business traveller carrying a portable PC has great difficulty in finding<sup>a</sup> telephone jacks to connect the PC to fetch electronic mail from either a host computer or a gateway switch. Connections for a PC's modem are difficult to find in airports and with the advent of digital PABX's in businesses and the telephone



connectors are incompatible with a PC's analog modem. Hotels and motels oftentimes have internal PABX's that prevent calls from automatically being placed by the user's PC to electronic mail gateway switches to retrieve information. Most portable PC modems will only operate correctly when connected to a true outside telephone line that has telephone battery voltages and dial tone available to permit the number to be dialed direct. The inability to find an appropriate connection to connect the PC modem when travelling has contributed to the degradation of electronic mail reception when the recipient is travelling. When travelling internationally, this problem is further compounded by the fact that most electronic mail gateway mailboxes require a 1-800 toll free number <sup>to be</sup> ~~is~~ dialed in order to connect the mailbox. Almost all 1-800 telephone numbers are available for continental use only and cannot be accessed from a foreign country.

Industry trends make it increasingly difficult to receive electronic mail. When PC's were exclusively considered an office or desktop machine, it was less difficult to deliver electronic mail. Advances in the state of the art in microelectronics have permitted PC's to be downsized to very lightweight portable (notebook), and notebook size computers. These portable units have the computing and storage power of the former desktop units and have lent themselves to the trend that they now become very portable in their utilization. They are small enough that they can easily fit into an attache case and/or a suit pocket. The net result is that the portable unit no longer resides in the office or the desktop. The portable unit now may be taken home at night, as well as on travel with the user, such as for business travel.

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Increased portability of PC's further aggravates the problem of automatic electronic mail delivery as a consequence of portability eliminating the wired communication paths which have been typically used in state of the art electronic mail systems. The electronic mail industry is currently experiencing a rapid growth rate.


Numerous communication companies are offering forms of electronic mail services. However, a problem arises that users of one electronic mail system currently cannot send electronic mail to a subscriber of another electronic mail system (e.g., AT&T E-mail to Sprint Mail, etc.). Numerous attempts are currently underway in the industry to solve this problem. Current attempts are the utilization of common protocols between electronic mail systems (e.g. X.400). However, the proposed system does not resolve the problems resultant from portability and travelling situations described above.

Fig. 2 illustrates a diagram of a prior art network 100 developed by Telefind Corporation of Coral Gables, Florida, which provides worldwide paging and data transmission capability and is a preferred form of the RF information transmission network used in practicing the present invention. This network is described in detail in ~~the Assignee's~~ United States Patents 4,866,431, 4,868,558, 4,868,562, 4,868,860, 4,870,410, 4,878,051, 4,881,073, 4,875,039 and 4,876,538 and United States patent application Serial Nos. 409,390, 464,675, 465,894, 464,680, 429,615, 429,541, 409,605, and 456,742 which are incorporated herein by reference in their entirety. The system is a distributed network of switches comprised of a plurality of local switches 112, a plurality of lata switches 114 and a plurality of hub switches 116 with

each switch being located in a different geographical location within an area being serviced by the system. The hub switches 116 may be located totally within a country to provide national service or in multiple countries to provide international service. Only a single portion of the network is labelled with reference numerals with it being understood that repeating portions exist such as for that portion under the jurisdiction hub switch #P. Communication links which are illustrated as a dotted arrow represent network structure which has been omitted for clarity that is identical to structure that is illustrated in detail. Additionally, one or more sublocal switches may optionally be provided within the system under the jurisdiction of the local switch as described in the aforementioned patents. The sublocal switches have been omitted for purposes of clarity. Each switch has jurisdiction over a geographic area. The functions performed by the local switch 112, the lata switch 114 and the hub switch 116 are described below. A local paging service 118 is typically connected to each of the local switches 112 which offers other paging services than that provided by the present invention although it should be understood that the local switch may be used exclusively to control all services offered at the local level. The local paging service 118 is typically an existing common carrier paging service which services an area within broadcast distance of a transmitter 115 under the jurisdiction of the local paging service to which the local switch 112 has been connected to permit the local paging service to function in the network to transmit pages to a plurality of paging receivers 119 (only one having been illustrated) connected to a peripheral device 119 which may be a data processor printer, telex service,

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facsimile service or other types of data processing devices. The paging receivers automatically download data stored in their memory upon connection to a printer for producing a printout of the data. The  
5 printer is sold with the receiver by Telefind Corporation of Coral Gables, Florida. The paging receivers 119 are described in United States Patents 4,849,750, 4,851,830, 4,853,688, 4,857,915, 4,928,100, 4,935,732, 4,978,944 and 5,012,235 and United States  
10 Patent application Serial Nos. 381,483, 381,527, 597,350 and 662,616 which are assigned to Telefind Corporation of Coral Gables, Florida. The transmitter 115 may be either an analog or digital transmitter. Communications between the local, lata and hub switches  
15 may be by any existing communication medium 120 such as direct dial-up circuits (IDD Circuits International), direct outward dial circuits (end-to-end), in-bound watts (and other in-bound services that are volume discounted), out-bound watts (and other out-bound  
20 services that are volume discounted), feature group A (U.S. service), feature group B (U.S. and European services), MF tie trunks (U.S. and European services), and direct inward dial (international service, where available), as well as any future medium which permits  
25 pages to be transmitted between switches. Each of these services are indicated schematically by a bi-directional arrow 120 which interconnects a local switch 112 to a lata switch 114, a lata switch to a hub switch 116, and a hub switch to another hub switch.  
30 Furthermore, the local switches 112 are connected to a local paging service 118 by a communication link 122 of any conventional nature, including wires connecting the local switch to the local paging service. Each switch is provided with a local telephone trunk 127 which  
35 functions as a maintenance port. Furthermore, dotted



bi-directional lines 124 illustrate alternative communication paths between switches which may be used in the case of malfunction or busy conditions. It should be further understood that the network is not limited to any particular communication protocol linking switches, nor connecting the local switch to the local paging service. A telephone trunk 28 functions as an input for manual (telephone handset) and automatic device entry of pages as described below.

The network 110 provides numeric, alphanumeric and data services to all points within the United States and participating countries. In the preferred embodiment of the network, a universal code is used for encoding transmissions of characters over both the communication links 120 and 122 which is compatible with existing analog and digital transmitters 115. A universal code discussed in the aforementioned patents utilizes sixteen tones for encoding all characters for transmission between switches or to a local paging service 118. Each character is transmitted as two successive tones. A X.25 modified transmission protocol which is disclosed in the aforementioned network patents is preferably utilized for transmitting packets of pages between switches.

The network 110 is economical to implement and operate as a consequence of utilizing distributed processing technologies and transmission of pages periodically in packets of pages between the switches. Dynamic interaction between a frequency agile pager, which preferably is of the type described in the above-referenced receiver patents and applications and the network 110 efficiently utilizes transmission time that is available in the frequency spectrum. One of the distinct advantages of the network 110 is that it utilizes existing paging common carriers to deliver

pages to the end user with existing paging RF coverage in the United States being greater than 85% of its geographical area with just two 150 MHz frequencies with a total of 10,500 additional frequencies being available for paging receiver use. Wire line common carriers, private systems, hospital, government, emergency and many other services can be accommodated by the utilization of dynamic frequency programming, by the network 110 to change the frequency band on which individual paging receivers may receive pages.

The network 110 provides an integrated sublocal, local, regional and nationwide paging network that is transparent to use by the subscriber and provides for pages (data transmissions) to be called into an existing local paging service 118 by the making of a local phone call on a telephone trunk 128 connected to the local switch 112 in a conventional fashion as well as to any data switch 114 throughout the network 110 by a local phone call to telephone trunk 126. The functionality of permitting pages or data transmissions to be originated anywhere within the network 110 by local telephone call, preferably by calling a single number within the country (950-XXXX) avoids the telephone expense and system overhead caused by calling of a central switch to originate a page. It should be understood that the network's usage of periodically transmitting packets of pages between switches results in a much lower cost than the cost of 800 or conventional long distance service. The phone trunk 126 for calling the data switch 114 to place a page anywhere within the network 110 is indicated by bi-directional arrows to each data switch. Regardless of the location of the person making the telephone call to a data switch 114 over telephone trunk 126 to originate a page, the data switch will formulate a page

with the destination specified by geographically descriptive digits of the identification code inputted with the call to request a page or data transmission to the lata switch and the network 110 will automatically route the page through the switches of the network to the person being paged by way of the local switch 112, which stores a subscriber file that stores the identification code of the subscriber and paging receiver. The local switch 112, which stores the identification code inputted with the page in its subscriber file, adds one or more destinations to the page and transmits the page(s) to the local paging service 118 and/or the network 110 by way of the lata switch 114 having jurisdiction. The person placing the page by calling the local switch 112 on telephone trunk 128 or the lata switch 114 on telephone trunk 126 does not have to know the location of the person receiving the page.

The local switch 112 is connected to a participating common carrier paging service 118 located in a particular geographic area. The local switch 112 has local direct inward dial trunks 128 which permits the subscriber to use a local telephone call to place a page. Pages over the local telephone trunks 128 may be (1) numeric characters which are entered manually by DTMF tones or other telephone coding mechanisms, (2) alphanumeric characters which are entered manually by DTMF tones or other coding mechanisms, (3) alphanumeric characters which are entered by an automatic message inputting device using an encoding format having a transmission protocol of conventional nature such as DTMF tones or (4) a high speed (baud rate) encoding protocol such as an X.25 protocol permitting a variable number of pages or data transmissions each with its own network destination to

be formed into a packet which is transmitted to a single switch. The local switch 12 has voice prompting which facilitates the person placing a call on the telephone trunk 28 to enter a message to be transmitted as a page.

5 The local switch 112 processes the pages received from the telephone trunk 128 and from the associated data switch 114 to which the local switch is connected by the communication link 120. It should be understood  
10 that the local switch 112 has programming which automatically and dynamically monitors paging traffic when a plurality of transmission frequencies are used and allocates the frequencies available to the paging service 118 for transmission to the paging receivers to  
15 maximize the local paging services paging throughput as described below. The local switch 112 calls the resident local paging terminal of the paging service 118 and determines how much air time it has to deliver a batch of pages to the transmitter 115  
20 associated with the local paging service. The local switch 112 then calls the local paging terminal of the local paging service 118 and transmits a batch of pages encoded in the hybrid encoding format described below which is compatible with existing analog and digital FM  
25 paging transmitters.

The local switch periodically transmits packets of pages or data transmissions stored in an outbound data buffer over communication link 20 to the data switch 114 having jurisdiction over it which provides  
30 cost efficient transmission and efficient page or data transmission processing. This architecture is highly efficient in routing the pages originating at the local switch 112 to be transmitted by the network 110 which are intended for broadcast by a transmitter remote from  
35 the local switch having a subscriber file storing the

15



identification code of the subscriber to which data or a page is to be transmitted.

When the subscriber desires to receive regional, national, or international service, the local data switch 112 is programmed by the subscriber by simple telephone area code entries which identify the service areas to which pages or data transmissions are to be transmitted. The programming is accomplished by adding or deleting one or more area codes of the subscriber's destination field contained in a subscriber file maintained in the subscriber's local switch 112. In the United States, area codes are used for ease of subscriber use and telephone books may then serve as the service area directory. The same ease of use is available to worldwide customers with county-city code entries available from telephone books in any airport, hotel or business.

The local switch controls the generation of individual pages or data transmissions having message detail as described below with reference to Fig. 6. The number of pages or data transmissions which are generated in response to a page received without an area destination from the telephone trunk 128 or from a data switch 114 is determined by the central processor of the local switch 112 interrogating any area destinations listed in the destination area code field of the local switch as described below with reference to Fig. 3. Each page or data transmission generated by the processor contains the same message content. A separate page or data transmission is generated for each destination area listed in the destination area code field and if the local service option of the service option field is selected, as described below, an additional page or data transmission is generated for broadcast by the local

paging service 118 without an area destination in the network which is processed by the local switch 112 as a page or data transmission received from the network for broadcast by the local paging service. Furthermore, each individual page or data transmission generated by a local switch 12 contains one or more commands. The commands which are added to each page or data transmission transmitting a message are determined by the operation of the central processor of the local switch 112 in response to interrogation of the selected service options of the subscriber. Programming of receivers with the channel programming command is in response to the local switch programming the receiver to receive one or more channels, subscriber programming of destination areas of reception in the destination area code field, and the degree of utilization of the channels of the local transmitter 115.

The central processor of the local switch 112 processes each individual page or data transmission received from the network to determine if it originated from a local switch 112 or a lata switch 114. This determination is made by determining if a destination header identifying a lata switch 114 originating the page precedes the paging receiver identification code in a packet having the configuration of Fig. 6. In the absence of the header (which is a geographic identification of the originating lata switch 112 in the network) in an individual page or data transmission, the page or data transmission is processed exclusively by the local switch 112 for broadcast by the associated local paging service 118 without interrogation of a subscriber file in the local switch. If the header is found in a page or data transmission, the central processor processes the page as either a request to reprogram the subscriber file or

112

as a page received on the telephone port 128 without an area destination which must be processed to determine one or more area destinations and <sup>be</sup> formed into new pages each with a different area destination from the area destination field if transmission by the network is to occur and into a page or data without an area destination if transmission by the local service 18 is to occur.

The local switch 112 also serves as the dynamic programming interface between the paging or data receivers 119 and the network 110. The local paging service 18 may cause channels to be received by receivers 19, change subscriber identification codes and add new customers to the network 110 utilizing the local switch 112. The functionality of the receiver 119 can be changed from a fixed channel to a multi-channel or a scanning receiver as required by use of the channel programming command.

Messages originating at the local switch 112 which are transmitted to the data collector switch 114 having jurisdiction over it are packetized as described below with reference to Fig. 6. Destination area codes (telephone area codes or other geographically descriptive code) are added to pages or data transmissions prior to transmission to the data switch 114 and the receiver 119 is dynamically and automatically reprogrammed for the new service areas by the local switch 112 issuing channel programming command(s) which ensures that the receiver 119 is programmed to receive channels in each designated area. The current channels remain in the receiver 119 to avoid loss of a message while a subscriber is still in the area.

The lata switch 114 provides a second tier of network intelligence. This intelligence includes page or data transmission processing, packetizing and routing. The lata switch 114 receives packets of pages from each of the local switches 112 within its jurisdiction as well as the hub switch 116 having jurisdiction over it. The lata switch 114 provides the geographical presence for the network 110 to originate and terminate pages or data transmissions utilizing dial-up or dedicated communication services.

The lata switch 114 is responsible for collection of pages from the local switches 112 within its jurisdiction. When a packet of pages is received from the local switch 112, it is disassembled, processed and stored for transmission to the proper destination(s) in one or more packets each consisting of one or more pages which are intended for destination(s) either within or outside the lata switch jurisdiction. The lata switch 114 periodically transmits packets of pages stored in its outbound hub buffer and its outbound local buffer to the associated hub switch 116 having jurisdiction over it and to local switches 112 within its jurisdiction which provides cost efficient transmission and efficient processing by avoiding processing by a single central switch controlling the network 110. This architecture is highly efficient in routing pages or data transmissions originating within the jurisdiction of the lata switch 114 which are intended for broadcast outside its jurisdiction as well as distributing pages or data transmissions from one local switch 112 to one or more additional local switches within the jurisdiction of the lata switch. If the page or data transmission is destined for distribution within the jurisdiction of the lata switch 114, the page or data transmission is processed

into packets for transmission to each of the local switches 112 within its jurisdiction or alternatively to less than all of the local switches in its jurisdiction. The pages or data transmissions are then  
 5 periodically transmitted as packets to the local switches 112 within the jurisdiction of the lata switch 114.

The lata switch 114 is also responsible for collection of pages outside its jurisdiction to be  
 10 broadcast to the local switches 112 within its jurisdiction. Packets received from the hub switch 116 are disassembled, processed, and packetized for transmission to the destination local switches 112.

The function of the lata switch 114 in collecting requests for placing pages or data transmissions in the network or to reprogram the subscriber file of a local switch 112 by placing a local phone call on telephone trunk 126 is an important aspect of the network.  
 15 ~~invention~~ The lata switch 114 places the header discussed above, which geographically identifies the lata switch originating the page or data transmission in front of the receiver identification code, in a packet as illustrated in the message detail of Fig. 6 to enable the local switch 112 to differentiate between  
 20 pages or data transmission which are for broadcast by the local service 118 associated with a receiving local switch 112 and pages or data transmission which require access to the subscriber files to generate one or more pages or data transmissions for broadcast or for  
 25 reprogramming a subscriber file. Preferably, the header is four digits comprised of a country code followed by the telephone area code identifying the lata switch 114 which received the call for the  
 30 originating page or data transmission.

The hub switch 116 provides the third tier of network intelligence and serves as an inter-regional communications link. One hub switch 116 will preferably be located in each international region to serve as a network routing switch. In the United States, a hub switch 116 will be located within the region served by each of the Bell regional companies (RBOC's). Accordingly, in the United States the preferred implementation of the network 110 includes seven distinct hub switches 116. Each hub switch 116 in a preferred embodiment can have fifty-five lata switches 114 under its jurisdiction. The hub switch 116 also serves as a network routing switch for inter-hub calls when pages or data transmissions are to continue in the hub-to-hub network.

When a packet of pages is received from either another hub switch 116 or a lata switch 114 within its jurisdiction, the pages or data transmission are disassembled for examination. Each page or data transmission is examined for its destination address(es). A determination is made if the hub switch 116 should forward the page or data transmission to one of the six adjacent hub switches or forward the page or data transmission to a lata switch 114 within its jurisdiction. The pages or data transmissions are then destination processed and packetized for transmission to either another hub switch 116 or a lata switch 114 within its jurisdiction.

Fig. 3 illustrates a memory map of the RAM of a local switch 112. The RAM has four main storage areas which are the subscriber files 154, channel files 156, lata buffers 158 and local buffers 160.

5 Each local switch 112 is allocated a capacity of, for example, 10,000 subscribers which are identified by a four-digit code stored in field 162 of the subscriber files 154.

10 Field 164 stores the subscriber's local telephone number within the area code serviced by the lata switch 114 having jurisdiction.

15 Field 166 is the subscriber's receiver identification code which uniquely identifies the subscriber and the receiver 119 of the subscriber which is to receive pages or data transmissions throughout the network 110. The receiver identification number (code) consists of 8 digits with the four most significant digits geographically representing the area serviced by the associated lata switch 114 (country code as the most significant digit followed sequentially by area or city code lesser significant digits) and the four least significant digits being digits assigned to identify 10,000 subscribers within the jurisdiction of the local switch. The capacity of  
20 the network 110 is 100 million subscribers with the eight digit identification code. The least significant numbers of the identification code define subscribers of a specific local switch 112 within the jurisdiction of the lata switch 114.

25 Field 168 stores the service options which each subscriber may choose to have provided by the local service 118. The service options control the commands, which are used with pages or data transmissions sent to the receivers 119. The main CPU interrogates the  
30 particular subscriber file identified by the  
35

identification code inputted with the request for a page or data transmission by telephone trunks 126 or 128, causes storage of the page or data transmission, determines the destination(s) of the page or data transmission and the appropriate system command to be used to transmit the page or data transmission. It should be understood that the service options may be dynamically programmed through voice prompted communications over the telephone trunk lines 128 with the local switch 112 and through telephone calls to the lata switch 114 by trunk 126 as described below.

The service options are described as follows. The service option "a" is for no service which is a condition when an active subscriber does not wish to receive any pages or data transmissions such as may occur when the subscriber is on vacation or is otherwise desirous of not being reached for a period of time but does not wish to be removed from the subscriber base of the system. The service option "b" is for pages or data transmissions to be broadcast only by the transmitter 115 of the local service 118. The service option "c" is for regional service which is for pages or data transmissions to be broadcast throughout all of the local services 118 which are within its lata switch jurisdiction. The service option "d" is for national service which is for pages or data transmissions to be broadcast from the local switch 112 to one or more lata switches 114 other than the lata switch having jurisdiction over the local switch. While not illustrated, an international service option may be added. The service option "e" is for a repeat of pages or data transmissions for any of the "b", "c" or "d" service options so that a page or data transmission is broadcast more than once. The service option "f" is for data service which causes the page or



data transmission to be stored in a specified section of the receiver memory. The service option "g" is for external data service which commands the receiver 119 to output the page or data transmission to the external data port of the receiver. This option permits the receiver 119 to support peripheral devices such as printers or processors to provide a wide range of data services.

The following additional fields are provided. The fifth field 170 is the subscriber's name and the subscriber's specified account number. The sixth field 172 is the subscriber's account number entry for purposes of interval billing by the local service 118. The seventh field 174 is the subscriber's count (local, regional or national) which is a total of the number of pages or data transmissions made in a billing period. The eighth field 176 is the total number of data characters sent during the billing period.

The ninth field 178 is the destination (area code(s)) of each of the pages or data transmissions. For local service, there is no area code specified. For regional service, the area code of the associated lata switch 114 having jurisdiction over the local switch 112 is specified and for national and international service, one or more area codes or other geographic identification identifying lata switches other than the lata switch having jurisdiction over the local switch are specified. For international service, a country code may be used to identify lata switches 114 within a particular country. Any number of area codes may be specified but in a preferred embodiment of the network 110, three area codes is a maximum number of lata switches 114 which may be specified as regions to receive pages from the local switch 112.

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The above-referenced description describes the first file of the n (10,000) possible subscriber files stored in the subscriber files 154. It should be understood that the other subscriber files have the same configuration. Access to the subscriber file is obtained by a voice prompted message requiring the inputting of a secret code which if inputted correctly is followed by voice prompted requests requesting specification of the information of the subscriber file to be changed.

The frequency files 156 perform an important function in the network 110. The frequency files 156 contain n possible lata files with each individual file identifying up to, for example, 15 four-digit numbers that represent broadcast channels available within the service area of a lata switch 114. Thus, each of the individual lata switches 114 in the network 110 will have a separate frequency file which identifies all of the channels which are available to transmit pages or data transmissions from the transmitters 115 associated with the local services 118 under the jurisdiction of that lata switch 114. The channels are stored as a four-digit number in a hexadecimal numbering system which requires only four digits of space. A file containing all zeros (no channel) will cause an invalid area code message to be returned to a subscriber attempting to reprogram service areas. The frequency files are the source of channels which are utilized by the channel programming command to program each receiver 119 for operation in each lata switch jurisdiction and the local switch jurisdiction. For example, a receiver 119 which is to be serviced by only a single local service 118 may be programmed to receive only a single or a number of channels up to the number of channels used by that local paging service.

Furthermore, for regional service or national service, the frequency files 156 are used to program the receiver 119 to receive pages or data transmissions from the channels used by the local services 118 within the designated area codes representative of the service areas serviced by the lata switches 114. Furthermore, if a receiver 119 is to be programmed to receive messages in a particular area serviced by a lata switch 114 as a consequence of the subscriber travelling, the channel programming command utilizes the channels stored in the file number corresponding to the jurisdiction of the lata switch 114 in the area to which the subscriber is to travel, to dynamically program the channel(s) which the paging receiver is to receive in that area. For service in a local region, the frequency files are used as a source of channels to be used by the channel programming command to dynamically shift the channels on which the paging receiver is to receive a page, to adjust the channels used in the broadcast area used by the local service 118 associated with the local switch 112 based on the amount of traffic on each channel and to further provide a source of channels which are to be used for specialized services for transmitting particular types of information to particular subscribers such as, but not limited to stock quotations.

The lata buffers 158 consist of an inbound lata buffer 180 and an outbound lata buffer 182. The inbound lata buffer 180 functions to receive pages or data transmissions coded in ASCII which have been processed to strip the X.25 transmission protocol used for transmitting pages from the lata switch 114 to the local switch 112 and converted from the hybrid code described below to ASCII. Pages or data transmissions which are initially stored in the inbound lata

buffer 180 are processed for destination and are either for broadcast by the associated local service 118 in which case they are ultimately stored in the appropriate identification code buffer 186 which matches the least significant digit of the identification code contained with the page or data transmission or in the outbound data buffer 182 if the page or data transmission originated from one of the data switches 114 by calling on the telephone trunk 126 and which has a final destination which is determined by the field 178 of the subscriber file 154.

The local buffers 160 are comprised of an inbound buffer 184 for receiving all local inbound pages or data transmissions which originate from the trunk line 128 which is connected to the local switch 112 and a plurality of identification code buffers 186 which are each individually assigned to store outbound pages or data transmissions with a particular least significant identification code digit of the number base used for the subscriber identification code which are to be transmitted to a receiver 119. All of the received pages or data transmissions from the local switch 112 are initially stored in the buffer 184. Each of the individual identification code buffers 186 stores pages or data transmissions for broadcast by the local service 118 in batches which are grouped by the least significant digit of the subscriber identification code received with the page or data transmission after sorting by the CPU. In other words, the least significant digit of the subscriber identification code within a page or data transmission for broadcast by a local service 118 determines in which of the identification code buffers 186 the page or data transmission is stored. For example, if the last digit of the identification code of a page or data

transmission for broadcast by the local service 118 ends in the digit 0, the page or data transmission is stored in the identification code buffer identified by "0".

5           Fig. 4 is a memory map of the random access memory of the lata switch 114. The random access memory has three main areas and two optional areas. The three main areas are hub buffers 188, local buffers 190 and a  
10           lata identification code (ID) memory 192. The optional memory areas are an all call buffer 194 for storing nationwide pages or data transmissions received from the hub switch 116 which are to be transmitted to all of the local switches 112 under the jurisdiction of the lata switch 114 and an all call buffer 196 which stores  
15           pages or data transmissions received from one of the local switches 112 which are to be transmitted to all of the local switches under the jurisdiction of the lata switch 114.

          The hub buffers 188 are an outbound hub buffer 198  
20           and an inbound hub buffer 200. The outbound hub buffer 198 stores pages or data transmissions to be periodically transmitted to the hub switch 116 having jurisdiction over the lata switch 114 under the control of the CPU. The inbound hub buffer 200 stores pages or  
25           data transmissions which are periodically received from the associated hub switch 116 via storage in a buffer of the CPU.

          The local buffers 190 are comprised of an inbound  
30           local buffer 202 which stores groups of inbound pages or data transmissions received from the local switches 112 and a plurality of outbound local buffers 204 each of which store groups of pages or data transmissions which are to be transmitted periodically to a specific one of the local switches with a separate  
35           outbound local buffer being provided for each of the

local switches under the jurisdiction of the lata switch 114. The CPU processes each of the pages or data transmission which is received in the inbound buffers 200 and 202 by destination and causes storage in the outbound buffers 198 and 204 which is associated with the destination of the page or data transmission.

The lata identification code memory 192 stores the subscriber identification numbers of all of the subscribers which are associated with each of the local switches 112 within its jurisdiction. The lata identification code memory 192 is used for determining the local switch 112 which stores a subscriber file of the subscriber used for pages or data transmission which are inputted to the system from a direct call by telephone trunk 126 to a lata switch 114 or from a direct call by telephone trunk 126 to a lata switch by a subscriber to program the reception area of pages or data transmissions by changing the destination 178 of the pages or data transmissions. The lata identification code memory 192 may be organized by subscriber identification codes which are within the jurisdiction of each local switch 112 so that the matching of an identification code of a page or data transmission inputted to the lata switch 114 in the lata identification code memory 192 provides the location of the particular local switch which stores the subscriber file 154 of that subscriber.

In order to avoid having to provide additional storage space in each of the outbound local buffers 204, the optional all call buffer 194 may be provided to store a single page or data transmission, received from the hub switch 116 having jurisdiction over the lata switch 114, which is to be transmitted to each of the local switches 112. Similarly, the optional all call buffer 196 may be provided for

receiving pages or data transmissions from an individual local switch 112 which are to be transmitted to all of the local switches within the jurisdiction of the lata switch 114.

5           For pages, data transmissions or requests to reprogram the subscriber file 154 which are made to a lata switch 114 over telephone trunk 126 which require access to a subscriber file outside the jurisdiction of the lata switch, the CPU forms a page or data  
10           transmission contained in a packet having an area destination identified by the four most significant digits of the identification code inputted to the lata switch 114 preceded by the identification code of the receiver 119 to receive the page or data transmission,  
15           preceded by the geographical area identification of the lata switch receiving the call to originate a page or data transmission or to program the subscriber file which is transmitted by the network 110 to the specified area destination. For pages or data  
20           transmissions to be billed to subscribers stored in the subscriber file 154 of a local switch 112 within the jurisdiction of the lata switch 114 or requests to program the subscriber file 154, the CPU forms a packet having an area destination of the local switch 112  
25           within its jurisdiction which stores the subscriber identification code as determined by interrogation of the lata identification code buffer 192 by the CPU. The ultimate destination of a page or data transmission is determined by the destination field 178 of the  
30           subscriber file 154 matching the identification code of the receiver 119 either within or outside the jurisdiction of the lata switch that is called in over telephone trunk 126. The local switch 112 containing the subscriber file 154 creates the one or more pages  
35           or data transmissions in accordance with the

information in the subscriber file including the adding of destination(s) and the appropriate command. Transmission of the pages or data transmissions created by the local switch 112 in response to a call to a data switch 114 is identical to the transmission of pages or data transmissions originating at the local switch 112 by the placing of a telephone call on telephone trunk 128. In the case of requesting programming of the subscriber's file 154, the caller must in response to a voice prompted message enter a four-digit secret identification code to obtain access to the subscriber file with voice prompted messages being supplied under the control of the CPU to control the input of programming information from the subscriber. To request a page or data transmission by calling the data switch 114, the caller will receive a voice prompted message to enter the subscriber identification code and then the appropriate page or data transmission.

Fig. 5 is a memory map of the random access memory of the hub switch 116. The hub switch memory map is comprised of four main parts which are hub buffers 206, data buffers 208, data code tables 210 and hub routing codes 212. The hub buffers 206 are comprised of a plurality of inbound hub buffers 214 which correspond in number to the number of other hub switches 116 in the network 110 which have direct connection to the hub switch and a corresponding number of outbound hub buffers 216. The individual inbound hub buffers 214 each store pages or data transmissions received from one of the hub switches 116 with pages or data transmissions received from each adjacent hub switch 116 being stored in only a single one of the inbound hub buffers 214. Similarly, pages or data transmissions which are to be transmitted to another hub switch 116 are stored in the outbound hub



buffer 216 which is associated with the destination hub switch to which they are being transmitted with all pages or data transmissions which are to be routed to a single hub switch being stored in a corresponding one of the outbound hub buffers 216 with a separate hub buffer being associated with each hub switch to which pages or data transmissions are directly transmitted. The data buffers 208 are comprised of a plurality of inbound data buffers 218 which correspond to the number of data switches 114 under the jurisdiction of the hub switch 116. The inbound data buffers 218 store all of the pages or data transmissions received from the data switches 114 under the jurisdiction of the hub switch 116. The outbound data buffers 220 correspond in number to the data switches 114 under the jurisdiction of the hub switch 116 with a separate data buffer being associated with each of the data switches. The outbound data buffers 220 store groups of pages or data transmissions to be periodically transmitted to their associated data switch 114. Pages or data transmissions which are stored in the inbound hub buffers 214 are processed by destination by the CPU and stored in either the outbound hub buffer 216, which is the destination of the pages or data transmissions not to be received by a data switch 114 under the jurisdiction of the hub switch 116, or in one or more of the outbound data buffers 220 if the destination of the packets received from another hub switch 116 is a data switch under the jurisdiction of the hub switch. The CPU also processes the pages or data transmissions stored in the inbound data buffers 218 according to their destination and causes their storage in either the outbound hub buffers 216 if the pages or data transmissions are to be sent to a data switch 114 outside of the jurisdiction of the hub switch 116 or to

one or more of the outbound lata switches 220 if the pages or data transmissions are to be received by one or more lata switches 114 under the jurisdiction of the hub switch 116.

5           The lata code tables 210 store each of the lata (telephone area or other geographic identifier) codes 222 under the jurisdiction of the hub switch 116 which are utilized by the comparison performed by the CPU with the pages or data transmissions stored in the  
10           inbound hub buffers 214 and inbound lata buffers 218 to determine in which of the outbound hub buffers 216 or outbound lata buffers 220 the pages or data transmissions should be stored. Each separate lata code 222 corresponds to the geographical identification  
15           of the lata switch 114 which in the preferred embodiment is the telephone area code of a lata switch's jurisdiction.

          The routing codes 212 determine the transmission routes to other hub switches on a priority basis to  
20           which a packet should be sent which are not intended for a lata switch 114 within the jurisdiction of the hub switch 116. It should be understood that a number of factors may be considered in choosing the priority of a route to be used to transmit a packet from one hub  
25           switch 116 to another hub switch. It would appear on first analysis that a direct first hub switch to second hub switch route would be best but often the switching overhead of routing a packet through one or more intermediate switches is more than compensated for by  
30           the efficiency of a route having one or more intermediate hub switches by adding additional pages or data transmissions to the packet which are inputted to the one or more intermediate hub switch(es) to the packets being transmitted to the second hub switch.  
35           The CPU compares the destination of the groups of pages

or data transmissions stored in the inbound hub  
 buffers 214 and the inbound data buffers 218 to  
 determine if these pages or data transmissions should  
 be routed to another hub switch 116. The hub routing  
 codes 212 are referred to by default when a match is  
 not found by the CPU in comparing the destination of  
 the pages or data transmissions stored in the inbound  
 hub buffers 214 and inbound data buffers 218 with the  
 codes stored in the data code tables 210. Each page or  
 data transmission stored in the inbound hub buffer 214  
 and inbound data buffers 218 is processed by  
 destination by the CPU and caused to be stored in the  
 outbound buffers 216 and 220 which correspond to its  
 destination. Each individual hub routing code contains  
 the hub switch destination priorities for pages or data  
 transmissions to be sent to a single data switch 114  
 outside the jurisdiction of the hub switch 116. For  
 example, for the data switch 114 having jurisdiction  
 over area code 312, the hub routing code 234 determines  
 the priorities in descending order from the highest  
 priority to the lowest priority such that the highest  
 priority hub would be #1 followed by #2-#6.

Fig. 6 illustrates a preferred transmission  
 protocol to be used for transmitting packets between  
 switches. The protocol which is used is a modified  
 X.25 protocol. As illustrated, each packet contains  
 five separate layers. The first layer is the  
 destination telephone number which is the receiving  
 port to receive the page or data transmission. With  
 reference to Fig. 2 if a packet of X.25 formatted pages  
 or data transmissions were to be sent from a first data  
 switch 114 to its associated hub switch 116 over  
 communication path 120, the destination telephone  
 number would be the telephone number of the hub  
 switch. It should be further understood that the X.25

transmission protocol as described herein may be utilized with other types of communication mediums between switches such that a destination telephone number may be replaced with another form of address of the receiving switch. The second layer indicates the packet size field in terms of succeeding layers of information. In the present case levels 3, 4 and 5 are provided which dictates that the packet size would store the number 3 to indicate the subsequently lower third, fourth and fifth layers. The third layer contains an origination switch address and a destination switch address which can be either telephone numbers or real addresses within the network 110. The fourth layer is the number of pages or data transmissions which are contained in a packet. As illustrated, this number may be any integer n. The fifth layer is one or more pages or data transmissions which each correspond to an individual page or data transmission to be sent to a particular receiver 119.

Each message includes the following information. In accordance with standard X.25 protocol, a beginning of file header is included. Following the beginning of file header is a receiver I.D. code which is the identification code of the destination receiver which is identical to the subscriber identification code stored in the subscriber files 154 of the subscriber to receive the page or data transmission. Following the I.D. code is the destination(s) of the page or data transmission which is geographically descriptive of the area to which the page or data transmission is to be transmitted and is added by the local switch 112 interrogating the destination field 178 of Fig. 3. In the preferred embodiment, the destination is a combination of country and area code as utilized by the telephone system to identify the area to which the page

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or data transmission is destined. For each country,  
 the same country code will be used so that if the  
 system 110 as illustrated in Fig. 1 were to be utilized  
 for the United States, the first digit of the  
 destination would be a 1. Similarly, the destinations  
 in other countries would be followed by different  
 numbers identifying those countries followed by code  
 which breaks up the identified country into smaller  
 geographic regions. ~~While the utilization of area~~  
~~codes under the telephone system facilitates the usage~~  
~~of the present invention, it~~ <sup>It</sup> should be understood that  
 a destination which is not based on the telephone  
 system is equally usable ~~with the present invention~~.  
 The field of special commands are the system commands  
 which are transmitted with each page or data  
 transmission to a receiver. The "page" or "data  
 transmission" is the part which is to be displayed to  
 the bearer of the receiver 119 and may be numeric or  
 alphanumeric characters. The end of the file and file  
 size information are part of a standard X.25 protocol.

Fig. 7 illustrates an interconnection between a  
 paging receiver (left side) in accordance with the  
 above-referenced receiver patents and a printer (right  
 side) which has been offered for sale by Telefind  
 Corporation of Coral Gables, Florida. The  
 "EXTERNAL ANTENNA" pin is for connection only to an  
 external antenna and connects the RF signal from the  
 external antenna to the receiver internal antenna. The  
 "LINK" pin is detected by the printer to determine if  
 the receiver 119 is connected or not. If the receiver  
 is not connected when peripheral power is on, then the  
 CPU of the printer will detect that the "LINK" pin is  
 high. Otherwise the "LINK" pin will be low. The pin  
 "EXTERNAL BUZZER" outputs a 2KHz trigger signal when a  
 page or data transmission is received. The

"EXTERNAL BUZZER" pin also outputs the 2KHz trigger signal when display of a message is complete. The pin "PRG VCC" is supplied 5 volt power by the attached printer to provide power to the receiver 119 whether the pager is powered or not. The "GROUND" pin is ground for the printer and receiver 119. The pin "BUSY" is pulled high by the printer if the printer is too busy to handle input data bits on the "PRTDATA" pin of the receiver 119. The "PRTDATA" pin is the data output from the receiver 119 to the printer. Serial data bits are fed to the printer to drive the printer to generate text corresponding to the data bits. The "DIS AUDIO" pin provides external audio which may be the X.25 modified protocol of Fig. 6 encoded into audio tones which modulate the channel carrier on which information is received by the receiver <sup>119</sup>19. When the "DIS AUDIO" pin is high, it indicates that the display button is pressed. The memory of the receiver 119 stores the text to be printed by the printer. The text is downloaded through the aforementioned interconnection upon connection to the printer to generate a hard copy of the text stored in the memory.

Disclosure of Invention

The present invention provides an integration of an electronic mail system with an RF information transmission network for transmitting electronic mail originating at processors either within or outside an electronic mail system by RF communication to at least one destination processor within an electronic mail system by <sup>an</sup> a RF receiver which relays the information to the destination processor and method of use thereof.

The RF receiver stores the received information which is to be relayed to the destination processor. Storage in the RF receiver memory permits the reception of the information without a connection of the RF receiver to the destination processor thus eliminating the requirement that the destination processor is turned on and carried with the user of the destination processor. In a typical application with a portable PC functioning as the destination processor, it is important that reception of the information by the RF receiver does not require the drawing of power from the PC battery. The RF receiver automatically <sup>transfers</sup> ~~relays~~ the information to the destination processor upon connection of the RF receiver to the destination processor. The destination processor may be within the same electronic mail system containing the originating processor which originated the information or another electronic mail system. While a preferred application of the invention is with portable destination processors, it should be understood that the originating and destination processors may be at a fixed site or portable. The use of the RF receiver to receive electronic mail permits fixed site destination processors to receive electronic mail without calling the electronic mail system as in the prior art by using the storage of the RF receiver which may be carried on the user of the destination

processor either within an office or other site or for travel. The RF receiver provides the automatic storage of electronic mail and review of its content without interaction with the destination processor. The stored messages may be transferred at a later time automatically without manually keying the message which is an important consideration in using portable PC's. The problems of the prior art in delivering electronic mail to destination processors within an electronic mail system which are being exacerbated by the increasing portability of personal computers and the absence of a current system for delivering electronic mail between electronic mail systems are overcome by the present invention.

The present invention transmits electronic mail from an originating processor to at least one destination processor through an interface switch. The interface switch connects an electronic mail system and/or at least one additional processor to <sup>an</sup> RF data transmission network which transmits the information to a RF receiver which is connectable to the destination processor to <sup>transfer</sup> ~~relay~~ the received RF message from the RF receiver to the destination processor.

The invention provides a system for connecting a plurality of electronic mail systems each transmitting information from one of a plurality of originating processors to at least one of a plurality of destination processors and method of use thereof. The system has at least one interface switch connecting an electronic mail system containing a plurality of originating processors which originate messages to a RF information transmission network which broadcasts the information to a RF receiver within the RF information transmission network which <sup>transfers</sup> ~~relays~~ the information to a destination processor within another electronic mail



system. The interface switch converts the information which has been formatted to the electronic mail system from which the information originated into a format compatible with the RF information transmission network and further discards information which is unique to the originating electronic mail system which is not utilized by the receiving electronic mail system and adds encoded information which is common to both the originating and receiving electronic mail systems to the information as it is transmitted through the RF information transmission network to compress the data which is broadcast to the RF receiver. The compressed data is converted by the RF receiver or destination processor into the format of the electronic mail system to which the destination processor is connected. As a result, it is possible to communicate between electronic mail systems which are not currently compatible as a consequence of having different information formatting and transmission protocols. The destination processors may be transported during use.

A system for connecting a plurality of electronic mail systems each transmitting information from one of a plurality of originating processors to at least one of a plurality of destination processors in accordance with the invention includes at least one interface switch, an interface switch being coupled to each of the plurality of electronic mail systems for receiving information originating from an originating processor in one of the electronic mail systems for transmission to a destination processor in another <sup>of the</sup> electronic mail system; and an RF information transmission network, coupled to the at least one interface switch, for transmitting ~~stored~~ information received from one of the at least one interface switch originating from an originating processor in <sup>the</sup> <sup>of the</sup> one electronic mail systems by

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F  
A  
RF transmission to at least one RF receiver which  
transfer  
relays the information to a destination processor  
within the another <sup>of the</sup> electronic mail <sup>systems</sup> system. The  
RF receiver may be detached from the destination  
5 processor during reception of the information with a  
memory of the RF receiver storing the information.  
Storage in memory permits review of the information  
prior to transferring the information to the  
destination processor by connecting the RF receiver to  
10 the destination processor.

A  
A  
The information is transmitted to a receiving  
interface switch from an originating processor in <sup>the</sup> one <sup>of the</sup>  
electronic mail systems in response to an address of the,  
receiving interface switch which has been added to the  
15 information originated at the originating processor  
within the one <sup>of the</sup> electronic mail system with the address  
specifying the another <sup>of the</sup> electronic mail system within  
which the destination processor is located and an  
address of the destination processor has been added to  
the information by either the one <sup>of the</sup> electronic mail  
20 systems or the receiving interface switch. The address  
is an identification number of the at least one  
receiver.

A  
A 25 <sup>An</sup> ~~The receiving interface switch~~ <sup>receiving the information</sup> removes information  
used by the one <sup>of the</sup> electronic mail systems used during  
transmission through the one electronic mail system and  
adds information used by the RF information  
transmission network during transmission of the  
information to the RF receiver. The ~~receiving~~  
30 interface switch <sup>receiving the information</sup> encodes a portion of the removed  
information and adds the encoded portion to the  
information which is transmitted by the RF information  
transmission network and the encoded information is  
decoded either by the RF receiver or the destination  
processor and <sup>is</sup> added in decoded form back to the  
A 35

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information which is processed by the destination processor with a format of the another electronic mail system to which the destination processor is connected.

5           The address of the destination processor is an  
 A           identification number of the RF receiver in the RF  
 A           information transmission network and the receiving  
 A           interface switch <sup>receiving the information</sup> stores information which has been  
           stored by <sup>the one of the</sup> at least one electronic mail system coupled  
 10          to the receiving interface switch, assembles the  
           information from a plurality of originating processors  
           into a packet and transmits the packet to the RF  
           information transmission network. The RF information  
 15          transmission network comprises a switch which receives  
 A           the packet from the receiving interface switch <sup>receiving the information</sup> and  
           disassembles the packet into information from the  
           plurality of originating processors. The information  
           transmission network transmits the disassembled  
           information including the identification number of the  
 20          RF receiver <sup>transferring</sup> ~~relaying~~ the information to the destination  
 F           processor to a switch in the RF information  
           transmission network storing a file identified by the  
           identification number and any destination of the RF  
           receiver in the RF information transmission network to  
           which the information and identification number is to  
 25          be transmitted by the RF information transmission  
           network and adds any destination of the RF receiver to  
           the information and the RF information transmission  
           network in response to the added destination transmits  
           the information and identification number to the  
 30          destination for broadcast to the RF receiver.

**Brief Description of Drawings**

Fig. 1 illustrates a prior art electronic mail system.

5 Fig. 2 illustrates a prior art paging system used by the present invention.

Fig. 3 illustrates a memory map of the local switch of the prior art paging system of Fig. 2.

Fig. 4 illustrates a memory map of a data switch of the prior art paging system of Fig. 2.

10 Fig. 5 illustrates a memory map of a hub switch of the prior art paging system of Fig. 2.

Fig. 6 illustrates a message format utilized by the prior art paging system of Fig. 2.

15 Fig. 7 illustrates a prior art connection between a receiver in the paging system of Fig. 2 and a printer.

Fig. 8 illustrates a block diagram of an electronic mail system in accordance with the present invention.

20 Fig. 9 illustrates a block diagram of the connection of a plurality of electronic mail systems through a plurality of interface switches to an input port of an RF information transmission network utilized by the present invention.

25 Fig. 10 illustrates a block diagram of the transmission of information originating from a plurality of electronic mail systems to a RF information transmission network to a plurality of destination processors and originating processors  
30 within a plurality of electronic mail systems in accordance with the present invention.

Fig. 11 illustrates possible distributed functions for performing data processing steps necessary to transmit information from an originating processor to a destination processor using RF transmission in accordance with the present invention.

Fig. 12 is a block diagram of an interface switch in accordance with the present invention.

#### Best Mode for Carrying Out the Invention

Figs. 8-10 illustrate a block diagram of an electronic mail system 100 which has been integrated with an RF information transmission network 302 for transmitting information from an originating processor within the electronic mail system to a destination processor within the electronic mail system utilizing RF communications in accordance with the present invention. Like reference numerals identify like parts in Figs. 1-10 and 12. The integrated system 100 differs from the prior art of Figs. 1-7 in that the originating processor, which may be any of the processors within computing systems #1-#N is provided the option of transmitting electronic mail (information) to at least one destination processor which may be any processor A-N within the processing systems #1-#N by means of an RF information transmission network 302 as described below. It should be understood that the present invention is not limited to the block diagram form of Figs. 8-10 and 12. Additionally, the communications between the originating processors, gateway switches 14 and destination processors may be through either a public or private switch telephone network <sup>314</sup> 104 and are not limited to any type of telephone system interconnection. The RF information transmission network 302 functions to transmit the information which

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originated from <sup>one of the originating processors</sup> ~~the originating processor~~ A-N within  
 any of the computing systems #1-#N to the destination  
 processor A-N within any of the computing systems #1-#N  
 by an RF transmission to an RF receiver 119. The RF  
 5 receiver 119 is connected to the destination processor  
 with the same connections as illustrated in the prior  
 art of Fig. 7.\* Upon connection, the receiver 119  
 relays the information from the RF receiver to the  
 destination processor. An important aspect of the  
 10 present invention is that reception and review of  
 electronic mail can be performed without connection of  
 the RF receiver 119 to the destination processor A-N  
 which permits the receiver to function as a mobile  
 electronic mail receiver. As a result, the user may  
 15 move from the site of the destination processor A-N  
 either within an office or other location or during  
 travel while receiving electronic mail which was not  
 possible with the prior art. Furthermore, the  
 connection of the RF receiver 119 to the destination  
 20 processor automatically transfers the electronic mail  
 stored within the memory of the RF receiver to the  
 destination processor without manual keyboarding. A  
 computer program for controlling the transfer of  
 information from the receiver 119 to a SAFARI™ laptop  
 25 computer of AT&T Corporation is contained within the  
 attached Appendix at pages 1-9. This program  
 automatically provides transfer of the stored  
 electronic mail stored within the memory of the  
 RF receiver 119 into the destination processor A-N  
 30 where it is accessible to application programs within  
 the destination processor. As a result, the  
 deficiencies of the prior art in requiring substantial  
 expense consequent from the making of telephone calls,  
 substantial labor resultant from the lost time of  
 35 persons making telephone calls and the inability to

\* WHEN THE RF RECEIVER 119 IS CONNECTED TO THE SAFARI COMPUTER,  
 THE CONNECTION IS POWERED BY THE SAFARI COMPUTER.

T&G 5-17-91  
 C. J. 5-17-91  
 M.P.P. 5-17-91

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deliver electronic mail messages and the more difficult  
 problem of delivering electronic mail messages to  
 portable processors is overcome. Moreover, as is  
 explained in detail below in conjunction with Fig. 11,  
 5 the initiation of an information transmission from an  
 originating processor A-N to a destination processor A-  
 N using an RF transmission by the RF information  
 transmission network 302 to an individual RF receiver  
 has many different options which are user friendly.  
 10 The initiation of the transmission of information from  
 an originating processor A-N to a destination  
 processor A-N using <sup>RF transmission by</sup> ~~the RF transmissions of~~ the RF  
 information transmission network 302 only requires the  
 identification of an address of the RF receiver, which  
 15 preferably is the identification number of the  
 receiver 119 in the RF information transmission network  
 and the designation of an address of an interface  
 switch in the form of an address such a "TF MOBOX"  
 which connects the electronic mail system to the RF  
 20 information transmission network as described below in  
 conjunction with Figs. 9 and 10. The initiator of an  
 electronic mail message, in the most user friendly form  
 of the invention, is only required to input into the  
 originating processor A-N an identification of the  
 25 destination processor A-N which typically is in the  
 form of a name such as "John Doe". The distributed  
 intelligence of the system implementing the present  
 invention, which may be located in any one of the  
 originating processors A-N, gateway switch 14 or  
 30 interface switch 304 or distributed therebetween as  
 described below with reference to Fig. 11, may be used  
 to add the necessary address of the interface switch  
 connecting the electronic mail system 1-N to the RF  
 information transmission network 302 and the  
 35 identification of the RF receiver 119 in the RF

information transmission network from the inputting of only an identification of the destination processor A-N. The addition of the identification number of the RF receiver 119 and the address of the interface switch may be implemented by the originating processor A-N of one of the computing systems #1-#N, a gateway switch 14 or an interface switch 304 as described below with reference to Fig. 9.

Fig. 9 illustrates a block diagram of the connection between a plurality of gateway switches with mailboxes 14 in different electronic mail systems to the RF information transmission network 302. It should be understood that multiple gateway switches with mailboxes 14 from a single electronic mail system 1-N may be connected to each interface switch 304 instead of the connection of a single gateway switch with mailbox to a single interface switch as illustrated. A plurality of interface switches 304 connect information transmitted from at least one electronic mail system as illustrated in Fig. 8, but optionally, a plurality of electronic mail systems 1-N each as illustrated in Fig. 8 are connected to a data input port of the RF information transmission system as illustrated in Fig. 12 which is preferably hub switch 116 of the prior art paging network described above with reference to Figs. 2-6. The dotted line communication paths 306 illustrate optional information transmissions in which information from a plurality of different electronic mail systems is concentrated at a single interface switch 304. The dotted line communication paths 307 illustrate connections to additional gateway switches with mailboxes 14 within electronic mail systems 1-N.

The function of the interface switches 304 is twofold. In the first place, the interface



F

switches 304 functions as a security check to determine that information transmissions originating from a gateway switch with mailbox 14 represent transmissions which should be coupled to a hub switch 116 of the RF information transmission network 302. The security check is performed by the interface switch 304 comparing the identification number of the RF receiver 119 which has been added by either an originating processor A-N or a gateway switch with mailboxes 14 with permissible identification numbers or the interface switch performing the addition of the identification number. The interface switch 304 also removes information added by the electronic mail system 1-N to the information originated by the originating processor A-N from the stored information received from one of the gateway switches 14 and adds information used by the RF information transmission network 302 during transmission of the information originated at the originating processor to a RF receiver 119 in the RF information transmission network 302 which receives the information and <sup>transfers</sup> ~~relays~~ it to the destination processor A-N. Additionally, the interface switch 304 encodes data, which is required to format the display of the CRT of the destination processor for the electronic mail system to which the destination processor is connected, in the form of a character or characters which are decoded by either the RF receiver 119 or the destination processor A-N and added in decoded form back to the information which is processed by the destination processor with a format of the electronic mail system to which the destination processor A-N is connected.

The interface switches 304 function to store information which has been stored by at least one gateway switch 114 that is received from a plurality of

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originating processors, assemble the information from a plurality of originating processors into a packet preferably having the format of that described above with reference to the prior art in Fig. 6 and transmit the packet to the hub switch 116 within the RF information transmission network 302. While the invention is not limited to the transmission of the packets from the interface switch 304 to the hub switch 116 of the RF information transmission system 302, the hub switch is the preferable node in the RF information transmission network to which communications from the gateway switches 14 should be transmitted as a consequence of it having jurisdiction over both data switches 114 and the local switches 112 in the RF information transmission network which results in lesser network overhead.

The hub switch 116 receives the packet from the receiving interface switch 304 and disassembles the packet into information from the plurality of originating processors either within a single electronic mail system such as system 1 or from a plurality of electronic mail systems, such as systems 1-N, or from outside of any electronic mail system from at least one additional processor 312 which is connected directly to interface switch 304 to originate information to be transmitted to a destination processor A-N in an electronic mail system as described below. The RF information transmission network 302 transmits the disassembled information from the hub switch 116 including the identification number of the RF receiver 119 <sup>transfers</sup> ~~relaying~~ information to the destination processor A-N to a local switch 112 storing the file 154 identified by the identification number and any destination 178 of the RF receiver in the RF information transmission network to which the

information and identification number is to be transmitted by the RF information transmission network and adds any destination of the RF receiver to the information in accordance with the prior art system described above with reference to Figs. 2-6. The RF information transmission network in response to any added destination transmits the information and identification number to the destination in accordance with the prior art system described above with reference to Figs. 2-6 for RF broadcast to the RF receiver 119 for <sup>transfers</sup> ~~relaying~~ to the destination processor A-N.

The information is transmitted to a receiving interface switch 304 from one or more gateway switches 14 by one or more electronic mail systems 1-N in response to an address of the receiving interface switch which has been added to the information originated by the originating processor by either the originating processor or gateway switch. The information is transmitted from the receiving interface switch 304 to the RF information transmission network with an address of the destination processor, such as a name of a user of the destination processor A-N, to receive the information which has been added by either the originating processor A-N, a gateway switch 14 or the receiving interface switch 304.

Various options exist for the adding of the address of the receiving interface switch and the address of the destination processor. Preferably, the address of the receiving interface switch is a code word, such as "TF-MOBOX", which is recognized throughout the electronic mail system when appended to information as directing the information to be transmitted to the interface switch 304. The address of the destination processor is preferably the

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identification number of the RF receiver 119 within the  
 RF information transmission network 302. The address  
 of the receiving interface switch may be added to the  
 information originated by the originating processor, by  
 5 a gateway switch 14 or by the originating processor A-  
 N. The address of the receiving interface switch 304  
 may be added to the information by matching an  
 identification of the destination processor A-N which  
 may be the name of the individual utilizing the  
 10 processor or some other information and adds an address  
 of an interface switch such as the aforementioned  
 "TF-MOBOX" stored with the matched identification of  
 the destination processor to the information as the  
 address of the receiving interface switch.  
 15 Alternatively, the originating processor may be used to  
 add the address of the receiving interface switch 14 by  
 an inputting of the address of the receiving interface  
 switch (TF-MOBOX) along with an identification of the  
 destination processor A-N (name of recipient using the  
 20 processor). The originating processor A-N may also add  
 the address of the receiving interface switch 304 by  
 matching an identification of the destination processor  
 (name of the user of the processor) with a stored  
 identification of a destination processor and adding an  
 25 address of the interface switch (TF-MOBOX) stored with  
 the matched identification of the destination processor  
 to the information as the address of the receiving  
 interface switch. The identification number may be  
 added to the information originated by the originating  
 30 processor or, alternatively, <sup>may be</sup> ~~is~~ added by the  
 originating processor by matching an identification of  
 the destination processor (the name of the user of the  
 processor) with a stored identification of a  
 destination processor (the authorized user of the  
 35 destination processor) and adding an identification

number stored with the matched identification of the destination processor to the information as the identification number of the RF receiver 119. Alternatively, the aforementioned matching process may be performed by either the gateway switch 14 or the interface switch 304.

The at least one additional processor 312 originates information from outside of any electronic mail system. The processors 312 provide an address of at least one destination processor in an electronic mail system, such as the name of the user, to receive information transmitted by the RF information transmission system 302 or an identification number of the RF receiver 119 receiving information and <sup>transferring</sup> ~~relaying~~ the information to the destination processor. The interface switch 304 which receives the information from each processor 312 adds information used by the RF information transmission network 302 during transmission of the information to the RF receiver 119 receiving the information in the same manner as described above with respect to the interface switch 304.

The advantage of connecting the processors 312 directly to the interface switch 304 is that the processors 312 are only required to have a telephone modem and support programming to format information for RF transmission to a destination processor A-N within any one of one or more electronic mail systems 1-N. The processors 312 are not required to have the necessary electronic mail system software present in originating processors A-N or interconnections with an electronic mail system. As a result of the connection to the interface switch 304, information originating from the additional processors 312 may be transmitted by RF transmission to a destination processor A-N

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within any one or a plurality of electronic mail systems with the user of the processor 312 or the processor 312 or the interface switch 304 only having to supply an identification number of the receiver 119 to input information into the RF information transmission system 302 for RF transmission to a destination processor.

The difference between originating information by one of the additional processors 312 outside of any electronic mail system and originating information by one of the processors within one of the electronic mail systems is that the direct connection of the additional processor to the interface switch 304 eliminates the requirement for the adding of an address of the interface switch 304 which is required by the electronic mail systems to forward the information to the interface switch where necessary formatting of the information to be compatible with the RF information transmission system is performed. The interface switch 304 packetizes information originating from the additional processors 312 in the same manner as described above with respect to information originating from within an electronic mail system. Information from within an electronic mail system and originating from additional processors 312 outside of the electronic mail system may be formatted into the same packets which are forwarded to the hub switch 116. Additionally, an interface switch 304 may be connected only to the additional processors 312 to provide an interface only for processors outside of any electronic mail system to destination processors A-N within one or more electronic mail systems 1-N. The only information which is necessary to be inputted by the additional processors 312 is the address of the destination processor (user of the processor). The addition of the

identification number of the receiver 119 may be added by matching of an identification of the destination processor with stored destination processors within the additional processor 312 or the interface switch 304 with an identification number of the receiver 119 ~~being~~ stored with an identification of a destination processor A-N ~~being~~ used as an identification of the destination processor upon a match having been made.

Fig. 11 summarizes electronic mail message entry methods for messages (information) originating from originating processors within an electronic mail system. The first entry method adds the address of the interface switch 304 and the destination processor preferably in the form of a user's name; the gateway switch 14 takes no action; and the interface switch 304 adds the identification number of the RF receiver 119. The second entry method adds the address of the interface switch 304 and the identification number of the receiver 119; the gateway switch 14 takes no action; and the interface switch 304 performs only the function of verifying that the identification number which was added by the originating processor is a valid identification number within the RF information transmission network 302. In the third method, the originating processor adds the destination processor preferably in the form of the user's name; the gateway switch adds the destination of the interface switch 304; and the interface switch 304 adds the identification of the receiver 119. In the fourth method, the originating processor adds the destination processor preferably in the form of the user's name only; the gateway switch 14 adds an address of the interface switch 304 and the identification number of the receiver 119; and the interface switch takes no action other than verification that the identification

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number of the receiver 119 added by the gateway switch 14 is valid. In the fifth method, the operator of the originating processor adds the destination processor, points to an icon displayed on a CRT associated with the originating processor and the originating processor adds the address of the interface switch 304; the gateway switch 14 adds the identification number of the receiver 119 and the interface switch 304 takes no action other than verification. In the sixth method, the operator of the originating processor adds the destination processor, the user of the originating processor points to an icon displayed by a CRT associated with the originating processor which causes the addition of the address of the interface switch 304; the gateway switch takes no action and the interface switch 304 adds the identification of the receiver 119. In the seventh method, the operator of the originating processor adds the destination processor, the user points to an icon displayed on a CRT associated with the originating processor causing the addition of the address of the interface switch 304 and the receiver identification number by comparing an identification of the destination processor, such as user name of the destination processor, to an identification of destination processors with identification numbers or RF receivers 119 which <sup>transfer</sup>~~relay~~ information to the destination processor; the gateway switch 14 takes no action; and the interface switch 304 takes no action.

Fig. 12 illustrates a block diagram of an interface switch 304 in accordance with the present invention. The interface switch 304 has a main CPU 400 to which is connected a floppy drive 402 and a hard drive 404 for providing memory storage for use by the CPU in executing the various functions of the interface



switch as described above. The program on pages 10-14 of the Appendix implements the function of the interface switch 304 in a 3B2 computer which interfaces with the Telefind Corporation data transmission network described in the above-referenced patents and the AT&T Corporation electronic mail system. A diagnostic and maintenance port 406 is connected to the CPU in accordance with standard practice. A main bus 408 is coupled to a plurality of serial ports 410 which are connected in series with a multispeed modem 412 which is connected to one of the additional processors 312 as discussed above with reference to Fig. 9, to at least one gateway switch with mailboxes 14 in at least one electronic mail system and to a plurality of network ports which are connected to a plurality of X.25 modems 414 which are connected in series with a network port 416 which is connected to hub switch 116 of Fig. 9. A module bay controller 418 controls the bus 408 in accordance with standard practice. Alternatively, if the interface switch is not connected to a gateway switch with mailboxes 14, the interface switch functions only as a general purpose collector switch for the additional processors 312.

While the invention has been described in terms of its preferred embodiments, it should be understood that numerous modifications may be made thereto without departing from the spirit and scope as defined in the appended claims. For example, while the invention has been described in terms of utilizing a preferred RF information transmission network, it should be understood that the invention is equally applicable to other forms of RF transmission systems for broadcasting information originating from an originating processor within an electronic mail system or from an additional processor outside of any electronic mail system to a

destination processor connected to an electronic mail system. It is intended that all such modifications fall within the scope of the appended claims.

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Claims

~~1. A system for connecting a plurality of electronic mail systems each transmitting information from one of a plurality of originating processors to at least one of a plurality of destination processors comprising:~~

~~at least one interface switch, an interface switch being coupled to each of the plurality of electronic mail systems for receiving information originating from an originating processor in one of the electronic mail systems for transmission to a destination processor in another electronic mail system; and~~

~~a RF information transmission network, coupled to the at least one interface switch, for transmitting stored information received from one of the at least one interface switch originating from an originating processor in one electronic mail system by RF transmission to at least one RF receiver which relays the information to a destination processor within the another electronic mail system.~~

2. A system in accordance with claim 1 wherein:

~~the information is transmitted to a receiving interface switch from an originating processor in one electronic mail system in response to an address of the receiving interface switch which has been added to the information originating at the originating processor within the one electronic mail system with the address specifying the another electronic mail system within which the destination processor is located; and~~

~~an address of the destination processor has~~  
been added to the information by either the one  
electronic mail system or the receiving interface  
switch.

- 5           3. A system in accordance with claim 2 wherein:  
            the address is an identification number of  
the at least one RF receiver.

- A  
10           4. A system in accordance with claim 1 wherein:  
            the receiving interface switch removes  
information used by the one electronic mail system used  
during transmission through the one electronic mail  
system and adds information used by the RF information  
transmission network during transmission of the  
information to the RF receiver.

- 15           5. A system in accordance with claim 4 wherein:  
            the receiving interface switch encodes a  
portion of the removed information and adds the encoded  
portion to the information which is transmitted by the  
RF information transmission network and the encoded  
20           information is decoded either by the RF receiver or the  
destination processor and added in decoded form back to  
the information which is processed by the destination  
processor with a format of the another electronic mail  
system.

- 25           6. A system in accordance with claim 2 wherein:  
            the receiving interface switch removes  
information used by the one electronic mail system used  
during transmission through the one electronic mail  
system and adds information used by the RF information  
transmission network during transmission of the  
30           information to the RF receiver.

~~7. A system in accordance with claim 6 wherein:~~

~~the receiving interface switch encodes a portion of the removed information and adds the encoded portion to the information which is transmitted by the RF information transmission network and the encoded information is decoded either by the RF receiver or the destination processor and added in decoded form back to the information which is processed by the destination processor with a format of the another electronic mail system.~~

8. A system in accordance with claim 3 wherein:

the receiving interface switch removes information used by the one electronic mail system used during transmission through the one electronic mail system and adds information used by the RF information transmission network during transmission of the information to the RF receiver.

9. A system in accordance with claim 8 wherein:

the receiving interface switch encodes a portion of the removed information and adds the encoded portion to the information which is transmitted by the RF information transmission network and the encoded information is decoded either by the RF receiver or the destination processor and added in decoded form back to the information which is processed by the destination processor with a format of the another electronic mail system.

~~10. An electronic mail system in accordance with claim 2 wherein:~~

the address of the destination processor is an identification number of the RF receiver in the RF information transmission network; and

the receiving interface switch stores information which has been stored by at least one electronic mail system coupled to the receiving interface switch, assembles the information from a plurality of originating processors into a packet and transmits the packet to the RF information transmission network.

11. An electronic mail system in accordance with claim 10 wherein the RF information transmission network comprises:

a switch which receives the packet from the receiving interface switch and disassembles the packet into information from the plurality of originating processors; and wherein

the RF information transmission network transmits the disassembled information including the identification number of the RF receiver relaying the information to the destination processor to a switch in the RF information transmission network storing a file identified by the identification number and any destination of the RF receiver in the RF information transmission network to which the information and identification number is to be transmitted by the RF information transmission network and adds any destination of the RF receiver to the information and the RF information transmission network in response to the added destination transmits the information and identification number to the destination for RF broadcast to the RF receiver.

~~12. An electronic mail system in accordance with claim 4 wherein:~~

the address of the destination processor is an identification number of the RF receiver in the RF information transmission network; and

the receiving interface switch stores information which has been stored by at least one electronic mail system coupled to the receiving interface switch, assembles the information from a plurality of originating processors into a packet and transmits the packet to the RF information transmission network.

13. An electronic mail system in accordance with claim 12 wherein the RF information transmission network comprises:

a switch which receives the packet from the receiving interface switch and disassembles the packet into information from the plurality of originating processors; and wherein

the RF information transmission network transmits the disassembled information including the identification number of the RF receiver relaying the information to the destination processor to a switch in the RF information transmission network storing a file identified by the identification number and any destination of the RF receiver in the RF information transmission network to which the information and identification number is to be transmitted by the RF information transmission network and adds any destination of the RF receiver to the information and the RF information transmission network in response to the added destination transmits the information and

~~identification number to the destination for  
RF broadcast to the RF receiver.~~

14. An electronic mail system in accordance with  
claim 5 wherein:

5           the address of the destination processor is  
an identification number of the RF receiver in the  
RF information transmission network; and

10           the receiving interface switch stores  
information which is stored by at least one electronic  
mail system coupled to the receiving interface switch,  
assembles the information from a plurality of  
originating processors into a packet and transmits the  
packet to the RF information transmission network.

15           15. An electronic mail system in accordance with  
claim 14 wherein the RF information transmission  
network comprises:

20           a switch which receives the packet from the  
receiving interface switch and disassembles the packet  
into information from the plurality of originating  
processors; and wherein

25           the RF information transmission network  
transmits the disassembled information including the  
address of the destination processor as an  
identification number of a RF receiver relaying the  
information to the destination processor to a switch in  
the RF information transmission network storing a  
subscriber file identified by the identification number  
and any destination of the RF receiver in the  
RF information transmission network to which the  
30           information and identification number is to be  
transmitted by the RF information transmission network  
and adds any destination of the RF receiver to the  
~~information and the RF information transmission network~~



~~in response to the added destination transmits the information and identification number to the destination for RF broadcast to the RF receiver.~~

5 16. An electronic mail system in accordance with claim 6 wherein:

the address of the destination processor is an identification number of the RF receiver in the RF information transmission network; and

A 10 the receiving interface switch stores information which has been stored by at least one electronic mail system coupled to the receiving interface switch, assembles the information from a plurality of originating processors into a packet and transmits the packet to the RF information transmission network.

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17. An electronic mail system in accordance with claim 16 wherein the RF information transmission network comprises:

20 a switch which receives the packet from the receiving interface switch and disassembles the packet into information from the plurality of originating processors; and wherein

25 the RF information transmission network transmits the disassembled information including the identification number of the RF receiver relaying the information to the destination processor to a switch in the RF information transmission network storing a file identified by the identification number and any destination of the RF receiver in the RF information transmission network to which the information and identification number is to be transmitted by the RF information transmission network and adds any

30 ~~destination of the RF receiver to the information and~~

~~the RF information transmission network in response to the added destination transmits the information and identification number to the destination for RF broadcast to the RF receiver.~~

5           18. An electronic mail system in accordance with claim 7 wherein:

          the address of the destination processor is an identification number of the RF receiver in the RF information transmission network; and

A 10           the receiving interface switch stores information which has been stored by at least one electronic mail system coupled to the receiving interface switch, assembles the information from a plurality of originating processors into a packet and  
15           transmits the packet to the RF information transmission network.

          19. An electronic mail system in accordance with claim 18 wherein the RF information transmission network comprises:

20           a switch which receives the packet from the receiving interface switch and disassembles the packet into information from the plurality of originating processors; and wherein

          the RF information transmission network  
25           transmits the disassembled information including the identification number of the RF receiver relaying the information to the destination processor to a switch in the RF information transmission network storing a file identified by the identification number and any  
30           destination of the RF receiver in the RF information transmission network to which the information and identification number is to be transmitted by the RF  
~~information transmission network and adds any~~

~~destination of the RF receiver to the information and~~  
the RF information transmission network in response to  
the added destination transmits the information and  
identification number to the destination for  
5 RF broadcast to the RF receiver.

20. An electronic mail system in accordance with  
claim 8 wherein:

A 10 the address of the destination processor is  
an identification number of the RF receiver in the  
RF information transmission network; and

15 the receiving interface switch stores  
information which has been stored by at least one  
electronic mail system coupled to the receiving  
interface switch, assembles the information from a  
plurality of originating processors into a packet and  
transmits the packet to the RF information transmission  
network.

20 21. An electronic mail system in accordance with  
claim 20 wherein the RF information transmission  
network comprises:

a switch which receives the packet from the  
receiving interface switch and disassembles the packet  
into information from the plurality of originating  
processors; and wherein

25 the RF information transmission network  
transmits the disassembled information including the  
identification number of the RF receiver relaying the  
information to the destination processor to a switch in  
the RF information transmission network storing a file  
30 identified by the identification number and any  
destination of the RF receiver in the RF information  
transmission network to which the information and  
~~identification number is to be transmitted by the RF~~

~~information transmission network and adds any~~  
destination of the RF receiver to the information and  
the RF information transmission network in response to  
the added destination transmits the information and  
5 identification number to the destination for  
RF broadcast to the RF receiver.

22. An electronic mail system in accordance with  
claim 9 wherein:

the address of the destination processor is  
10 an identification number of the RF receiver in the  
RF information transmission network; and

the receiving interface switch stores  
information which has been stored by at least one  
electronic mail system coupled to the receiving  
15 interface switch, assembles the information from a  
plurality of originating processors into a packet and  
transmits the packet to the RF information transmission  
network.

23. An electronic mail system in accordance with  
20 claim 22 wherein the RF information transmission  
network comprises:

a switch which receives the packet from the  
receiving interface switch and disassembles the packet  
into information from the plurality of originating  
25 processors; and wherein

the RF information transmission network  
transmits the disassembled information including the  
identification number of the RF receiver relaying the  
information to the destination processor to a switch in  
30 the RF information transmission network storing a file  
identified by the identification number and any  
destination of the RF receiver in the RF information  
transmission network to which the information and

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~~identification number is to be transmitted by the RF information transmission network and adds any destination of the RF receiver to the information and the RF information transmission network in response to the added destination transmits the information and identification number to the destination for RF broadcast to the RF receiver.~~

Add  
B1

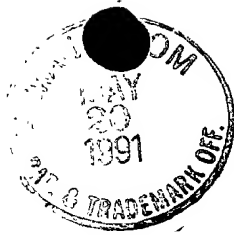
Add  
C12  
D1



System For Interconnecting Electronic  
Mail Systems By RF Communications

Abstract OF THE DISCLOSURE

5 A system (100) for connecting a plurality of mail  
systems (1-N) each transmitting information from one of  
a plurality of originating processors (A-N) to at least  
one of a plurality of destination processors (A-N)  
which may be transported during operation in accordance  
with the invention includes at least one interface  
10 switch (304), an interface switch being coupled to each  
of the plurality of electronic mail systems of  
receiving information originating from an originating  
processor in one of the electronic mail systems for  
transmission to a destination processor in another  
15 electronic mail system; and a RF information  
transmission network (302), coupled to the at least one  
interface switch, for transmitting stored information  
received from one of the at least one interface switch  
originating from an originating processor in one  
20 electronic mail system by RF transmission to at least  
one RF receiver which relays the information to a  
destination processor within the another electronic  
mail system.



### Appendix

An Appendix containing a listing of control programs for controlling the transmission of information between an RF receiver and a destination processor and controlling the operation of an interface switch in accordance with the invention is attached. The programs are written in the C programming language. The program for controlling the transmission of information from the RF receiver to the destination processor appears at pages 1-9 and the program for controlling the operation of the interface switch appears at pages 10-<sup>12</sup>~~14~~. The Appendix contains subject matter which is copyrighted. A limited license is granted to anyone who requires a copy of the program disclosed therein for purposes of understanding or analyzing the invention, but no license is granted to make a copy for any other purposes including the loading of a processing device with code in any form or language.



**Cross-Reference to Related Applications**

Reference is made to other applications which are filed on even date herewith which are incorporated by reference in their entirety.

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A  
A

United States Patent Application Serial No. 07/102,939, entitled "Electronic Mail System With RF Communications to Mobile Processors"; and <sup>^</sup> ~~(Attorney Docket No. 780-29643X00); and~~ <sup>^</sup>

A10

A  
A

United States Patent Application Serial No. 07/102,319, entitled "Electronic Mail System With RF Communications to Mobile Processors Originating From Outside of the Electronic Mail System"; <sup>^</sup> ~~(Attorney Docket No. 780-29766X00);~~ <sup>^</sup>







160250Z SEPT 72

```
(
    case 1:
        /*      datestr = mm/dd, timestr = hh:mm      */
        sscanf(datestr,"%d/%d",&month,&day);
        /*      get year from pc      */
        t = time(NULL);
        fprintf(outfile,"Date: %s",ctime(&t));
        break;
    case 2:
        fprintf(outfile,"From: %s",buffer);
        break;
    case 3:
        fprintf(outfile,"Subject: %s",buffer);
        fprintf(outfile,"To: <Name here>\n");
        if (msg_num_opt)
            fprintf(outfile,"Message #%s\n",msg_num);
        break;
    default:
        fprintf(outfile,"%s",buffer);
        break;
}
else
(
    if (line == 1)
    (
        t = time(NULL);
        fprintf(outfile,"Date: %s",ctime(&t));
        fprintf(outfile,"From: tftmbox\n");
        fprintf(outfile,"Subject: Telfind Network Message\n");
        fprintf(outfile,"To: <Name here>\n");
        if (msg_num_opt)
        (
            fprintf(outfile,"Message #%s\n",msg_num);
            fprintf(outfile,"%s",buffer+3);
        )
        else
            fprintf(outfile,"%s",buffer);
        )
    else
        fprintf(outfile,"%s",buffer);
}

if (strcmp(buffer,DELIMITER) == 0)
(
    msg_num_opt = line = attmail = 0;
)

line ++;
```

```

/* Copyright:      1990 TELEFIND CORP.
   Author:         MICHAEL P. PONSCHKE, SR.
                  03/13/91

   Program:        SAFARI3.C
   Purpose:        TO EXTRACT MESSAGES FROM A TELEFIND PAGER
                  VIA IN RS-232 PORT ON A PC

   Compiler:       TURBO C++ 1.0
   Memory Model:   SMALL

```

```

#include <dos.h>
#include <stdio.h>
#include <conio.h>
#include <string.h>
#include <stdlib.h>
#include "safari.h"

```

```

/*          CONSTANTS          */

#define DTR_HI      0xd1
#define DTR_LO      0xfe
#define RTS_HI      0x02
#define RTS_LO      0xfd
#define DSR_HI      0x20
#define RING_IN     0x40
#define CD_HI       0x80
#define FIVE_TICK   5
#define FIVE_SEC    96
#define TWELVE_SEC  220
#define LOG_FILE    "LOGH"
#define INTRO_STRING "Please standby, retrieving messages ..."

```

```

/*          FUNCTION PROTOTYPES          */

int beep(void);
void busyoff(void);
void busyon(void);
void disoff(void);
void dison(void);
int link(void);
void print_message(void);
int rxdata(void);
int strobe(void);
int strobe_data(void);
unsigned ticks(void);
int timeout(unsigned start, int delay);

```

```

/*          VARIABLE DECLARATIONS          */

char pager_buffer[311];
int com_base, control_reg, status_reg, log_flag;
FILE *log_file;

```

```

void main(int run_arg, char **args)
{
    unsigned start;
    int restart, x;

    com_base = 0x3f8; /* use com 1 unless command line denotes otherwise */

    /* get command line arguments */

```

```

/* all command line arguments begin with a single '-' and
must be separated by a single space between each other
and the program name

-1 Use COM port 1
-2 Use COM port 2
-7 Log all activity to a file named LOG */

if (num_arg > 1)
{
    for (x=1; x<num_arg; x++)
    {
        if (strcmp(args[x], "-1") == 0)
            com_base = 0x3f8;
        if (strcmp(args[x], "-2") == 0)
            com_base = 0x2f8;
        if (strcmp(args[x], "-7") == 0)
            log_flag = 1;
    }
}

if (log_flag)
    if ((log_file = fopen(LOG_FILE, "at")) == NULL)
        printf("Unable to open LOG\n");

control_reg = com_base + 4;
status_reg = com_base + 6;

clrscr();

if (link() == 0) /* is pager attached ? */
{
    printf("Please attach Message Receiver \n");
    exit(0);
}

busyon(); /* start busy as logic high */

if (log_flag)
    fprintf(log_file, "Initiating process \n");
printf("%s\n", INTRO_STRING);
dison(); /* push display button */
sleep(2);
do
{
    start = ticks();
    restart = 0;
    do
    {
        if (beep())
        {
            print_message();
            restart = 1;
            start += TWELVE_SEC;
            break;
        }
    }
    /* hold display button for 12 seconds */
    while(! timeout(start, TWELVE_SEC));
}
while(restart);

dison(); /* release the display button */
if (log_flag)
{
    fprintf(log_file, "Process Complete \n");
}

```

```

        fclose(log_file);
    }

    /*
    pager beep */
    int beep(void)
    {
        /*
        accesses the RI line via the Status Register
        which is activated when the pager beeps */
        unsigned start;
        start = ticks();
        while ( ! timeout(start,FIVE_TICK))
        {
            if ((inportb(status_reg) & RING_IN) == 0 )
                return(1);
        }
        return(0);
    }

    /*
    busyon & busyoff toggle the DTR line via the
    Control Register to strobe in data from the pager */
    void busyoff(void)
    {
        outportb(control_reg,inportb(control_reg) | DTR_HI);
    }

    void busyon(void)
    {
        outportb(control_reg,inportb(control_reg) & DTR_LO);
    }

    /*
    dison & disoff toggle the RTS line via the Control Register
    to simulate the pressing of the display button on the pager */
    void dison(void)
    {
        outportb(control_reg,inportb(control_reg) | RTS_HI);
    }

    void disoff(void)
    {
        outportb(control_reg,inportb(control_reg) & RTS_LO);
    }

    int link(void)
    {
        /*
        accesses the CD line via the Status Register
        which is logic high when pager is connected */
        if (((inportb(status_reg) & CD_HI) == 0)
            return(0);
        return(1);
    }

    void print_message(void)
    {
        FILE *file;
        unsigned start;
        int x,y=0,z=0,chr,bit;
    }

```

```

busyoff(); /* ready to accept pager data */
/* read until end code received */
while (chr != 3)
{
    chr = 0;
    start = ticks();
    /* wait for start bit */
    do
    {
        bit = strobe();
        if (bit == 0)
            break;
    }
    while (!timeout(start, FIVE_SEC));
    if (bit)
    {
        if (log_flag)
            fprintf(log_file, "Transmission Error, recheck connection\n");
        disoff();
        exit(0);
    }
    /* strobe out 8 bit data */
    for (x=1; x<9; x++)
    {
        chr <<= 1;
        chr |= bit = strobe_data();
    }
    /* clear out stop bits */
    for (x=1; x<3; x++)
    {
        strobe_data();
    }
    /* extract start and end codes from message
    pager signon      02, 18, 00, 33
    pager signoff     03 */
    if ((y > 3) && (chr != 3))
    {
        /* pager characters 96 and 97 are converted to
        0xFA and 0xFB to display on pager */
        if (chr == 0xFA) /* convert to CR */
            chr = '\n';
        if (chr == 0xFB) /* convert to TAB */
            chr = 0x09;
        pager_buffer[z] = chr;
        z++;
    }
    y++;
}
pager_buffer[z] = '\0'; /* null terminate */
busyon(); /* finished receiving data */

```







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```
/* mark the end of the command line you built,so you can add ending
   delimiter */
sys_command[i] = NULL;
/* add the ending quote for the users message so shell wont
   interepert special characters */
strcat(sys_command, "'");
/* execute command you built */
system(sys_command);

printf("sending message: %s\n", sys_command);
}
else {
    if(strlen(msg) == 0 ) {
        return(0);
    }
    /* print error for invalid message length */
    printf("telemail error: invalid message length: %s\n", msg);
    return(0);
}
return(i);
}

/*****
*
* function: getline(hold-buffer, input-file-pointer)
* arguments: pointer to buffer where line read will be heald,
*            file pointer to input file
* description: reads 1 line of text from the input line and stores the
*            line read into the buffer passed.
* returns: -1 if EOF or number of characters read in
*
*****/
getline(buff, fp)
char *buff;
FILE *fp;
{
    int ch, cnt;

    /* keep on reading charactrs from file so long as end of file not
       reached or char is the end of line */
    for(cnt = 0; ((ch = fgetc(fp)) != EOF) && ch != '\n'; cnt++) {
        /* MOD BY OT 11/29/90 convert tab to space */
        /* convert tabs to single space */
        if(ch == 9) {
            ch = ' ';
        }
        /* MOD BY OT 11/29/90 dont allow control char */
        /* only load in ascii characters */
        if(isprint(ch) != 0) {
            buff[cnt] = ch;
        }
        else {
            /* turn control characters to spaces */
            buff[cnt] = ' ';
        }
    }
    /* mark the end of the buffer you built */
    buff[cnt] = '\0';
}
```

```

/*****
*
*   function: send_mesg(message-pointer)
*   arguments: pointer to text message(capcode,text) to be sent
*   description: takes passed message text makes sure the first 8 positions
*               are numeric(capcode). it builds and executes the network
*               send command(netsend.sh) to sedn the message passed.
*   returns: 0 if not sent otherwise the number of characters sent out
*
*****/
int send_mesg(mesg)
char *mesg;
{
    char sys_command[700];
    int i;
    int ch;
    char *mesg_ptr;

    /* left justify the message passed to remove leading spaces */
    strljust(mesg, 512);
    /* trim off trailing blank spaces from the message */
    strtrim(mesg);

    /* make sure you have a capcode at least */
    if(strlen(mesg) > 8) {

        /* start to build the command to be executed to send message retrieved
        from the mail box */
        strcpy(sys_command, "netsend.sh ");

        /* loop while still more characters in the message */
        for(mesg_ptr = mesg, i = 11; *mesg_ptr != NULL; i++, mesg_ptr++) {

            /* make sure the first 8 positions of the message are numeric */
            if((i < 19) && (*mesg_ptr < '0' || *mesg_ptr > '9')) {
                printf("telemail error: invalid capcode: %s\n", mesg);
                return 0;
            }

            /* is the user didnt seperate capcode & message then insert a
            space into the command */
            if(i == 19 && *mesg_ptr != ' ') {
                sys_command[19] = ' ';
                i = 20;
            }

            /* enclose the users message with ' so shell wont interpret
            special characters */
            if(i == 20) {
                sys_command[20] = '\'';
                i = 21;
            }

            /* put the character from the message onto to the
            command to be executed */
            sys_command[i] = *mesg_ptr;
        }
    }
}

```

```

/* since your just starting clear the message area */
memset(mesg, NULL, MAXMSGLEN);

/* keep on geting lines from the file until you reach end of file */
while(getline(buff, fp) != -1) {
    /* every mail message start with the word "From " */
    if(strncmp(buff, "From ", 5) == 0) {
        /* set flag telling you are currently going thru mail header
           so you dont add it to the message */
        in_header = 1;
        /* call routine to the last message if any exists */
        send_mesg(mesg);
        continue;
    }

    /* a mail header end with the following string */
    if(strncmp(buff, "Content-Length:", 15) == 0) {
        /* turn off flag so you know you are no longer in mail
           message header */
        in_header = 0;
        /* clear the old message since this is a new one */
        memset(mesg, NULL, MAXMSGLEN);
        continue;
    }

    /* if the line you are now reading in not part of the mail header
       add it to the message */
    if(in_header == 0) {
        strljust(buff, 512);
        strtrim(buff);
        /* make sure you dont add more than the message length */
        if( (strlen(buff) + strlen(mesg)) < MAXMSGLEN) {
            strcat(mesg, " ");
            strcat(mesg, buff);
        }
    }
}

} /* end of read line while */

/* send the last message in the file */
send_mesg(mesg);
}

```

```

/* *****
*
*   Program name: telemail.c    network mail pickup
*   Description:  program searches the passed "mail" file and extracts
*                 the messages from it. a message is delimited by the words
*                 "message length" and "From ". these messages are then
*                 out on the telefind network. non ascii characters
*                 are skipped and invalid messages are displayed to the
*                 standard output.
*
*   author: Oren Tavory
*   site: telefind.corp
*   date: 11/25/90
*   modification history:
*       11/29/90 MOD BY OT fix problem of tabs being sent to network
*                       by converting tabs to a space char
*       11/29/90 MOD BY OT fix problem of control characters being
*                       passed if the message
*
* ***** */
#include <stdio.h>
#include <string.h>
#include <ctype.h>

#define MAXMSGLEN 512
#define MAXLINELEN 512

void main(argc, argv)
int argc;
char *argv[];
{
    FILE *fp;
    char *buff;
    char *mesg;
    int in_header;

    /* make sure user passed filename to be converted */
    if(argc != 2) {
        printf("telemail ERROR: Usage: telemail mail-filename\n");
        exit(1);
    }

    /* open the mail file */
    if((fp = fopen(argv[1], "r")) == NULL) {
        printf("telemail error: cant open mail file %s\n", argv[1]);
        exit(2);
    }

    /* allocate need buffer that will hold each line of the file */
    if((buff = (char *) malloc( MAXLINELEN * sizeof(char))) == NULL) {
        printf("telemail error: cant allocate memory for buffer\n");
        exit(3);
    }

    /* allocate buffer for message to be stored */
    if((mesg = (char *) malloc( MAXMSGLEN * sizeof(char))) == NULL) {
        printf("telemail error: cant allocate memory for message\n");
        exit(4);
    }
}

```

```
}  
    if(ch == EOF) {  
        return (-1);  
    }  
    else {  
        return(cnt);  
    }  
}
```

1  
2  
3  
4  
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## DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name, I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**"SYSTEM FOR INTERCONNECTING ELECTRONIC MAIL SYSTEMS BY RF  
COMMUNICATIONS"**

the specification of which (check one)



is attached hereto.



was filed on \_\_\_\_\_

as Application Serial No. \_\_\_\_\_

and was amended on \_\_\_\_\_

(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

## Prior Foreign Application(s)

## Priority Claimed

None

(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
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_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

None

(Application Serial No.)	(Filing Date)	(Status: patented, pending, abandoned)
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

I hereby appoint as principal attorneys; Donald R. Antonelli, Reg. No. 20,178; David T. Terry, Reg. No. 20,178; Melvin Kraus, Reg. No. 22,466; Stanley A. Wal, Reg. No. 26,432; William I. Solomon, Reg. No. 28,565; Gregory E. Montone, Reg. No. 28,141; Ronald J. Shore, Reg. No. 28,577; Donald E. Stout, Reg. No. 26,422; Alan E. Schiavelli, Reg. No. 32,087 and James N. Dresser, Reg. No. 22,973 to prosecute and transact all business connected with this application and any related United States application and international applications. Please direct all communications to the following address:

601 Antonelli, Terry, Stout & Kraus  
602 Suite 600  
602 1919 Pennsylvania Avenue, N.W.  
701 Washington, D.C. 20006  
Telephone: (202) 828-0300

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date May 17 1991 40100 (Full Name) Inventor Thomas J. Campana, Jr. (Signature) Thomas Campana, Jr.  
Residence Same As Post Office Address Citizenship U.S.  
Post Office Address 3836 West 86th Street, Chicago, Illinois 60652  
Date 5-17-91 40200 Inventor Michael P. Ponschke Michael P. Ponschke  
Residence Same As Post Office Address IL Citizenship U.S.  
Post Office Address 212 Tara Drive, Lockport, Illinois 60441  
Date 5-17-91 40300 Inventor Gary F. Thelen Gary F. Thelen  
Residence Same As Post Office Address IL Citizenship U.S.  
Post Office Address 16 Fox Lane, Palos Park, Illinois 60464  
Date \_\_\_\_\_ Inventor \_\_\_\_\_  
Residence \_\_\_\_\_ Citizenship \_\_\_\_\_  
Post Office Address \_\_\_\_\_  
Date \_\_\_\_\_ Inventor \_\_\_\_\_  
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Residence \_\_\_\_\_ Citizenship \_\_\_\_\_  
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Residence \_\_\_\_\_ Citizenship \_\_\_\_\_  
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Post Office Address \_\_\_\_\_  
Date \_\_\_\_\_ Inventor \_\_\_\_\_  
Residence \_\_\_\_\_ Citizenship \_\_\_\_\_  
Post Office Address \_\_\_\_\_



Applicant or Patentee: Thomas J. Campana, Jr., et al.  
Serial or Patent No.: \_\_\_\_\_ Attorney's Docket No.: 780.29767X00  
Filed or Issued: May 20, 1991  
For: "SYSTEM FOR INTERCONNECTING ELECTRONIC MAIL SYSTEMS BY RF COMMUNICATIONS"

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY  
STATUS (37 CFR 1.9(f) and 1.27(b)) - INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled "System for Interconnecting Electronic Mail Systems by RF Communications" described in

- ☒ the specification filed herewith.  
☐ Application Serial No.: \_\_\_\_\_, filed: \_\_\_\_\_  
☐ Patent No.: \_\_\_\_\_, issued: \_\_\_\_\_

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

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☒ persons, concerns, or organizations listed below.\*

\*NOTE: Separate verified statements are required from each named person, concern, or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27).

FULL NAME: Thomas J. Campana, Jr.  
ADDRESS: 3836 West 86th Street, Chicago, Illinois 60652  
☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

FULL NAME: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_  
☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

FULL NAME: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_  
☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

THOMAS J. CAMPANA, JR.

NAME OF INVENTOR

*Thomas J. Campana, Jr.*  
Signature of Inventor

*May 17 1991*  
Date

MICHAEL P. PONSCHKE

NAME OF INVENTOR

*Michael P. Ponschke, Sr.*  
Signature of Inventor

*5-17-91*  
Date

GARY F. THELEN

NAME OF INVENTOR

*Gary F. Thelen*  
Signature of Inventor

*5-17-91*  
Date

## FILING RECEIPT



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 Patent and Trademark Office  
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SERIAL NUMBER	FILING DATE	GRP ART UNIT	FIL FEE REC'D	ATTORNEY DOCKET NO.	DRWGS	TOT CL	IND CL
07/702,938	05/20/91	261	\$ 345.00	780.29767X00	12	23	1

ANTONELLI, TERRY, STOUT & KRAUS  
 1919 PENN. AVE., N.W., STE. 600  
 WASHINGTON, DC 20006

Receipt is acknowledged of the patent application identified herein. It will be considered in its order and you will be notified as to the examination thereof. Be sure to give the U.S. SERIAL NUMBER, DATE OF FILING, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this transmittal.

Applicant(s)

THOMAS J. CAMPANA JR., CHICAGO, IL; MICHAEL P. PONSCHKE,  
 LOCKPORT, IL; GARY F. THELEN, PALOS PARK, IL.

FOREIGN FILING LICENSE GRANTED 05/30/91

\* SMALL ENTITY \*

TITLE

ELECTRONIC MAIL SYSTEM WITH RF COMMUNICATIONS TO MOBILE PROCESSORS.

PRELIMINARY CLASS: 379

(see reverse)